Formation of Alkaline and Earthy Bodies, with reference to their presence in Plants, the Influence of Carbonic Acid in their generation, and the equilibrium of this gas in the atmosphere." By Robert Rigg, Esq. Communicated by the Rev. J. B. Reade, M,A., F.R.S.

The object of the author, in the present memoir, is to show that the solid materials which compose the residual matter in the analysis of vegetable substances, and which consist of alkaline and earthy bodies, are actually formed during the process of fermentation, whether that process be excited artificially, by the addition of a small quantity of yeast to fermentable mixtures, or take place naturally in the course of vegetation, or of spontaneous decomposition. His experiments also tend to show that this formation of alkaline and earthy bodies is always preceded by the absorption of carbonic acid, whether that acid be naturally formed or artificially supplied. He finds, also, that different kinds of garden mould, some being calcareous, others siliceous, and others aluminous, exposed in retorts to atmospheres consisting of a mixture of carbonic acid gas and common air, absorb large quantities of the former, combining with it in such a manner as not to afford any traces of this carbonic acid being disengaged by the action of other acids. He considers the result of this combination to be the formation of an alkaline body, and also of a colouring matter. This combination takes place to a greater extent during the night than during the day; and in general, the absorption of carbonic acid by the soil is greatest in proportion as it is more abundantly produced by the processes of vegetation; and conversely, it is least at the time when plants decompose this gas, appropriating its basis to the purposes of their own system. Hence he conceives that there is established in nature a remarkable compensating provision, which regulates the quantity of carbonic acid in the atmosphere, and renders its proportion constant.

A paper was also read, entitled, "Note on the Art of Photography, or the application of the Chemical Rays of Light to the purposes of Pictorial Representation." By Sir John F. W. Herschel, Bart., K.H., V.P.R.S., &c.

The author states that his attention was first called to the subject of M. Daguerre's concealed photographic processes, by a note from Captain Beaufort, dated the 22nd of January last, at which time he was ignorant that it had been considered by Mr. Talbot, or by any one in this country. As an enigma to be solved, a variety of processes at once presented themselves, of which the most promising are the following; 1st, the so-called de-oxidizing power of the chemical rays in their action on recently precipitated chloride of silver; 2ndly, the instant and copious precipitation of a mixture of a solution of muriate of platina and lime-water by solar light, forming an insoluble compound, which might afterwards be blackened by a variety of agents; 3rdly, the reduction of gold in contact with deoxidizing agents; and, 4thly, the decomposition of an argentine compound soluble in water, exposed to light in an atmosphere of peroxide of chlorine, either pure or dilated.

Confining his attention, in the present notice, to the employment of chloride of silver, the author inquires into the methods by which the blackened traces can be preserved, which may be effected, he observes, by the application of any liquid capable of dissolving and washing off the unchanged chloride, but of leaving the reduced, or oxide of silver, untouched. These conditions are best fulfilled by the liquid hyposulphites. Pure water will fix the photograph, by washing out the nitrate of silver, but the tint of the picture resulting is brick-red; but the black colour may be restored by washing it over with a weak solution of hyposulphite of ammonia.

The author found that paper impregnated with the chloride of silver was only slightly susceptible to the influence of light: but an accidental observation led him to the discovery of other salts of silver, in which the acid being more volatile, adheres to the base by a weak affinity, and which impart much greater sensibility to the paper on which they are applied: such as the carbonate, the nitrate, and the acetate. The nitrate requires to be perfectly neutral; for the least excess of acid lowers in a remarkable degree its susceptibility.

In the application of photographic processes to the copying of engravings or drawings, many precautions, and minute attention to a number of apparently trivial, but really important circumstances, are required to ensure success. In the first tranfers, both light and shadow, as well as right and left, are the reverse of the original: and to operate a second transfer, or by a double inversion to reproduce the original effect, is a matter of infinitely greater difficulty; and in which the author has only recently ascertained the cause of former failures, and the remedy to be applied.

It was during the prosecution of these experiments that the author was led to notice some remarkable facts relating to the action of the chemical rays. He ascertained that, contrary to the prevailing opinion, the chemical action of light is by no means proportional to the quantity of violet rays transmitted, or even to the general tendency of the tint to the violet end of the spectrum: and his experiments lead to the conclusion that, in the same manner as media have been ascertained to have relations *sui generis* to the calorific rays, not regulated by their relations to the rays of illumination and of colour, they have also specific relations to the chemical spectrum, different from those they bear to the other kinds of spectra. For the successful prosecution of this curious investigation, the first step must consist in the minute examination of the chemical actions of all the parts of a pure spectrum, not formed by material prisms, and he points out, for that purpose, one formed in Fraunhofer's method, by the interference of the rays of light themselves in passing through gratings, and fixed by the heliostat.

He notices a curious phenomenon respecting the action of light on nitrated paper; namely, its great increase of intensity, under a certain kind of glass strongly pressed in contact with it; an effect which cannot be explained either by the reflection of light, or the presence of moisture; but which may possibly be dependent on the evolution of heat.

Twenty-three specimens of photographs, made by Sir John Her-

schel, accompany this paper: one, a sketch of his telescope at Slough, fixed from its image in a lens; and the rest copies of engravings and drawings, some reverse, or first transfers; and others second transfers or re-reversed pictures.

March 21, 1839.

The MARQUIS of NORTHAMPTON, President, in the Chair.

Thomas William Fletcher, Esq., and the Rev. Thomas Gaskin, were balloted for, and duly elected into the Society.

The following papers were read:—

I. "Description of a Compensating Barometer, adapted to Meteorological purposes, and requiring no corrections either for Zero, or for Temperature." By Samuel B. Howlett, Esq., Chief Military Draftsman, Ordnance. Communicated by Sir John F. W. Herschel, Bart., K.H., V.P.R.S., &c.

In the instrument here described, there is provided, in addition to the ordinary barometric tube (inverted, in the usual way, in a cistern of mercury,) a second tube of the same dimensions, placed by the side of the former, and likewise filled with mercury, but only to the height of twenty-eight inches above the level of the mercury of the cistern. This tube is closed at its lower end, and fixed to a float supported by the mercury in the cistern: and it bears, at its upper end, an ivory scale, three inches in length. The elevation of the mercury in the barometric tube is estimated by the difference between its level and that of the mercury in the closed tube; and is measured on the ivory scale by the aid of a horizontal index, embracing both the tubes, and sliding vertically along them. As the float which bears the closed tube, to which the scale is attached, rests freely on the mercury in the cistern, and consequently always adjusts itself to the level of that fluid, no correction for the zero point is needed; and as every change of temperature must similarly affect the columns of mercury in both the tubes, after the scale has been adjusted so as to read correctly at any given temperature, such as 32°, which may be effected by comparison with a standard barometer, every other reading will correspond to the same temperature, and will require no correction. The author considers the error arising from the difference of expansion corresponding to the different lengths of the two columns of mercury, and which will rarely amount to one four-hundredth of an inch, as too small to deserve attention in practice, being, in fact, far within the limits of error in ordinary observations.

Subjoined to the above paper is a letter from the author to Sir John Herschel, containing a statement of comparative observations made with a mountain barometer, and with the compensation barometer, from which it appears that the use of the latter is attended with the saving of a great quantity of troublesome calculation. The comparative observations are given in a table, exhibiting a range of differences from $+\cdot012$ to $-\cdot016$ of an inch.